



Testimony

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F-35 AIRCRAFT SUSTAINMENT

DOD Faces Challenges in Sustaining a Growing Fleet

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Accessible Version

GAO Highlights

Highlights of [GAO-20-234T](#), a testimony before the Subcommittees on Readiness and Tactical Air and Land Forces, Committee on Armed Services, House of Representatives

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Why GAO Did This Study

DOD's F-35 Lightning II fighter aircraft provides key aviation capabilities to support the U.S. National Defense Strategy. The F-35 is also DOD's most costly weapon system, with U.S. sustainment costs estimated at more than \$1 trillion over its life cycle. As of October 2019, there were more than 435 U.S. and international F-35 aircraft in operation, with more than 3,300 aircraft expected to be fielded throughout the life of the program. While there is little doubt that the F-35 brings unique capabilities to the U.S. military, DOD faces significant challenges in sustaining a growing fleet.

This statement discusses F-35 sustainment challenges. It also summarizes GAO's open recommendations related to these challenges.

This statement is based on previously published work since 2014 related to F-35 acquisition, sustainment, affordability, ALIS, operations, and the global supply chain.

What GAO Recommends

GAO has 21 recommendations related to the challenges described in this statement that DOD has not fully implemented. DOD generally concurred with all 21 recommendations. Continued attention to these recommendations is needed by DOD to successfully operate and sustain the F-35 fleet over the long term within budgetary realities.

November 13, 2019

F-35 AIRCRAFT SUSTAINMENT

DOD Faces Challenges in Sustaining a Growing Fleet

What GAO Found

The Department of Defense (DOD) faces challenges in sustaining a growing F-35 fleet. This statement highlights three challenges DOD has encountered related to F-35 sustainment, based on prior GAO work (see figure).

Selected F-35 Sustainment Challenges



Supply Chain

Spare parts shortages are keeping F-35 aircraft on the ground more than expected. From May through November 2018, F-35s across the fleet were unable to fly about 30 percent of the time due to a lack of parts.

Several factors contribute to these parts shortages, including F-35 parts that are breaking more often than expected, and DOD's limited capability to repair parts when they break.



Autonomic Logistics Information System (ALIS)

ALIS, a key component of the F-35, is intended to provide users the tools to operate and sustain the aircraft.

However, ALIS' capabilities are immature and require personnel to perform time-consuming, manual workarounds. Users also have concerns about its deployability and data accuracy, among other things.



Long-term Sustainment Planning

Looking to the future, DOD lacks information about the technical characteristics and costs of the F-35 to effectively plan for long-term sustainment.

This will impair its ability to negotiate planned performance-based contracts or pursue alternative options.

Source: GAO. | GAO-20-234T

As a result of these challenges, F-35 performance has not met warfighter requirements. While DOD works to address these issues, it must also grapple with affordability. DOD has determined that it will need to significantly reduce F-35 sustainment costs—by 43 percent per aircraft, per year in the case of the Air Force—in order for the military services to operate the F-35 as planned.

Continued attention to GAO's recommendations in these areas will be important as DOD takes actions to improve F-35 sustainment and aircraft performance for the warfighter.

Chairmen Garamendi and Norcross, Ranking Members Lamborn and Hartzler, and Members of the Subcommittees:

Thank you for the opportunity to be here today to discuss the Department of Defense's (DOD) sustainment of F-35 aircraft. As you know, the F-35 Lightning II provides key aviation capabilities to support the National Defense Strategy. It is DOD's most costly weapon system, with sustainment costs for the United States alone estimated at more than \$1 trillion. The F-35 is also DOD's most ambitious weapon system, with three military services and many foreign nations purchasing the F-35 for their militaries. While production continues to ramp up, as of October 2019, there were more than 435 U.S. and international F-35 aircraft in operation at 19 sites, with more than 3,300 aircraft expected to be fielded through the life cycle of the program.

We have published a series of reports examining both DOD's acquisition and its sustainment of the F-35. My statement today will focus on sustainment. Sustainment involves the activities necessary to operate aircraft after they are fielded—such as maintenance, supply chain management, training, and engineering support. Sustainment costs typically comprise about 70 percent of a weapon system's life-cycle cost. In particular, we have reported on significant challenges that DOD faces in sustaining a growing F-35 fleet. As a result of these challenges, F-35 performance has not met warfighter requirements. Mission capability—that is, the percentage of total time when the aircraft can fly and perform at least one mission—was 52 percent from May through November 2018, as compared with a warfighter minimum requirement of 75 percent. Further, although the United States is purchasing the F-35 for its advanced capabilities, during that same time period, full mission capability—or the percentage of time when the aircraft can perform all tasked missions—was about 27 percent, as compared with a warfighter minimum requirement of 60 percent.

Today I will highlight three F-35 sustainment challenges DOD has encountered related to: (1) the supply chain; (2) the Autonomic Logistics Information System (ALIS), which supports supply-chain management, maintenance, and other processes; and (3) long-term planning. I will also summarize our recommendations related to these issues that DOD has not fully implemented.

This statement is based on our body of work issued from 2014 through 2019 addressing F-35 acquisition, sustainment, affordability, ALIS,

operations, and global supply chain. To perform our prior work, we analyzed DOD plans, program guidance, and F-35 performance; and we interviewed DOD, military service, and contractor officials at the headquarters' level and at many military installations that house F-35 aircraft. The reports listed on the Related Products Page provide more details on the scope and methodologies we used to carry out our prior work, including data reliability assessments.

We conducted the work on which this testimony is based in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

DOD Faces Substantial Supply Chain Challenges

First, DOD is facing substantial supply chain challenges that are hindering the readiness of the F-35 fleet. Specifically, spare parts shortages throughout the F-35 supply chain are contributing to F-35 aircraft being unable to perform as many missions or to fly as often as the warfighter requires.

The F-35's unique supply chain is central to DOD's strategy to sustain the growing fleet. Rather than owning the spare parts for their aircraft, the Air Force, Navy, and Marine Corps, along with international partners and foreign military sales customers, share a common, global pool of parts. This construct for the F-35 supply chain was intended to ease the logistical burden and provide economies of scale for the military services and international partners; however, the global pool does not have enough spare parts. Specifically, from May through November 2018, F-35 aircraft across the fleet were unable to fly about 30 percent of the time due to parts shortages, as compared with a program target of 10 percent.

Below is pictured an F-35B aircraft conducting training aboard a ship.

Figure 1: U.S. Marine Corps F-35B Conducting Training aboard the U.S.S. *America*



Source: U.S. Marine Corps photo by Lance Cpl. Juan Anaya. | GAO-20-234T

Our work found that several factors contribute to these parts shortages, including F-35 parts that are breaking more often than expected, and DOD's limited capability to repair parts when they break.¹ Specifically, as of April 2019, the F-35 program was failing to meet four of its eight reliability and maintainability targets—which determine the likelihood that the aircraft will be in maintenance rather than available for operations—including metrics related to part removals and part failures.² For instance, we reported at that time that the special coating on the F-35 canopy that enables the aircraft to maintain its stealth had failed more frequently than expected, and the manufacturer was unable to produce enough canopies to meet demands.³

¹GAO- F-35 Aircraft Sustainment: DOD Needs to Address Substantial Supply Chain Challenges, [GAO-19-321](#) (Washington, D.C.: Apr. 25, 2019).

²GAO- F-35 Joint Strike Fighter: Action Needed to Improve Reliability and Prepare for Modernization Efforts, [GAO-19-341](#) (Washington, D.C.: Apr. 29, 2019).

³[GAO-19-321](#)

These reliability challenges are exacerbated by DOD's limited capability to repair broken parts at the military depots.⁴ The capabilities to repair parts are currently 8 years behind schedule. DOD originally planned to have repair capabilities at the depots ready by 2016, but as we reported in April 2019, the depots will not have the capability to repair all parts at expected demand rates until 2024.⁵ As a result, the average time taken to repair an F-35 part was more than 6 months, or about 188 days, for repairs completed between September and November 2018—more than twice as long as planned. At that time, there was a backlog of about 4,300 spare parts awaiting repair at depots or manufacturers.

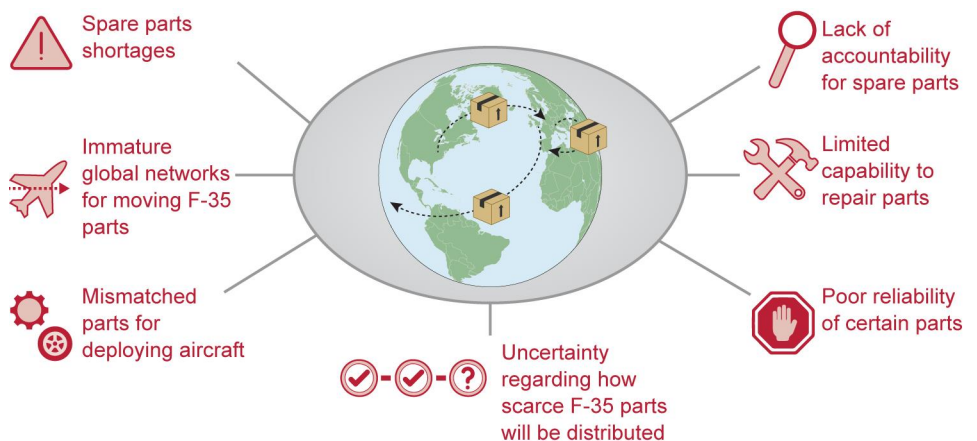
We have also reported on other challenges that DOD faces related to its supply chain, including challenges in supporting deployed F-35 aircraft around the world, in clarifying how scarce parts will be distributed, in establishing a plan for a global supply chain network, and in maintaining accountability for spare parts.⁶ Figure 2 depicts many of these and other challenges that DOD faces related to the F-35 supply chain.

⁴The F-35 sustainment strategy has a two-level maintenance concept, consisting of organizational-level maintenance, which is performed by squadron-level personnel; and depot-level maintenance. Depot-level maintenance includes structural repair, software upgrades, engine system overhaul and repair, component repair, and other activities that require specialized skills, facilities, or tooling to conduct repairs. DOD is establishing modification and repair capabilities at six military service depots in the United States as well as at additional repair facilities overseas.

⁵The F-35 program has identified 68 different repair workloads, or types of part repairs. Repair capabilities for these different workloads are projected to be in place at various dates between 2017 and 2024.

⁶[GAO-19-321](#)

Figure 2: Selected F-35 Supply Chain Challenges



Source: GAO. | GAO-20-234T

DOD has not fully implemented seven of our recommendations related to its supply chain challenges:

- Revise sustainment plans:** In October 2017, we reported that DOD's reactive approach to planning for and funding the capabilities needed to sustain the F-35 resulted in significant readiness challenges—including delays in the establishment of part repair capabilities at the depots—and placed DOD at risk of being unable to leverage the capabilities of the aircraft it had purchased.⁷ We recommended that DOD revise its sustainment plans to ensure that they include the key requirements and funding needed to fully implement the F-35 sustainment strategy.
- Conduct a comprehensive review of the F-35 supply chain:** While DOD had ongoing efforts to increase the availability of spare parts, we found in April 2019 that DOD would likely continue to face challenges because the program was not planning for the quantity of parts necessary in its spare parts projections to meet warfighter requirements. Simply purchasing more F-35 parts may not be a viable solution for DOD, given the affordability concerns the program faces. These complex problems necessitate a comprehensive approach by DOD, or it is at risk that the F-35 will not be able to conduct the full range of intended missions. We recommended that DOD conduct a

⁷GAO- F-35 Aircraft Sustainment: DOD Needs to Address Challenges Affecting Readiness and Cost Transparency, [GAO-18-75](#) (Washington, D.C.: Oct. 26, 2017).

comprehensive review of the F-35 supply chain to determine what additional actions are needed to close the gap between warfighter requirements for aircraft performance and the capabilities that the F-35 supply chain can deliver, in light of the U.S. services' affordability constraints.

- **Develop a process to modify the afloat and deployment spare parts packages:** DOD purchases certain packages of F-35 parts years in advance to support aircraft on deployments, including on ships—called afloat and deployment spare parts packages. In April 2019, we reported that continued modifications to parts and aircraft can make such packages out-of-date by the time F-35 units deploy, and that the F-35 program did not have a process and funding in place to change out mismatched parts. This could put the military services at risk of not having the parts they need to support future deployments. We recommended that DOD develop a process to modify afloat and deployment spare parts packages, to include reviewing the parts within the packages to ensure that they match deploying aircraft and account for updated parts demand, and aligning any necessary funding needed for the parts updates.
- **Mitigate risks related to operating and sustaining the F-35 in the Pacific:** In March 2018, we issued a classified report on DOD's initial transfer of F-35s to a Marine Corps base in Japan that, among other things, described the warfighting capabilities the F-35 brought to the Pacific and assessed operational challenges the Marine Corps faced.⁸ In April 2018, we publicly reported on the recommendations from this classified report, including our recommendation that the Marine Corps assess the risks associated with key supply chain-related challenges related to operating and sustaining the F-35 in the Pacific, and that it determine how to address those risks.⁹
- **Revise the business rules for prioritizing scarce F-35 parts:** In April 2019, we reported that there was uncertainty about how the program will prioritize scarce F-35 parts among global participants. While the F-35 program had developed a set of business rules, those rules lacked clarity and detail. Absent comprehensive business rules, the F-35 program could face challenges in transparently allocating

⁸GAO-18-79C

⁹GAO, *Warfighter Support: DOD Needs to Share F-35 Operational Lessons Across the Military Services*, [GAO-18-464R](#) (Washington, D.C.: Apr. 25, 2018). DOD deemed some of the information in the March 2018 report to be classified, which must be protected from loss, compromise, or inadvertent disclosure.

parts to support competing U.S. and international requirements. We recommended that DOD revise the business rules for the prioritization of scarce F-35 parts across all program participants so as to clearly define the roles and responsibilities of all stakeholders, the process for assigning force activity designations, and the way in which deviations from the business rules will be conducted.

- **Complete a detailed plan for the establishment of the global network for moving F-35 parts:** In April 2019, we reported that DOD's networks to move F-35 parts around the world to the United States and international participants were immature. Because the F-35 program did not fully recognize the complexity of establishing a global network for moving F-35 parts, this network is now several years behind schedule and there is risk that it will not be fully capable to support an expanding fleet. We recommended that DOD complete a detailed plan for the establishment of the global network for moving F-35 parts that outlines clear requirements and milestones to reach full operational capability, and that includes mechanisms to identify and mitigate risks to the F-35 global spares pool.
- **Clearly establish how DOD will maintain accountability for F-35 parts:** In April 2019, we reported that in its rush to field aircraft and its heavy reliance on the prime contractor, DOD had not consistently followed DOD guidance for property accountability. Simply put, DOD did not have records of all the F-35 spare parts it had purchased; where those parts were located; and how much the military services had paid for them. We recommended that DOD issue a policy consistent with DOD guidance that clearly establishes how DOD will maintain accountability for F-35 parts within the supply chain, and identify the steps needed to implement the policy retrospectively and prospectively.

DOD concurred with these recommendations and has made some progress in addressing them, including issuing a revised life cycle sustainment plan in January 2019. In addition, DOD has taken actions to increase the availability of spare parts, such as efforts to improve the reliability of parts and incentivize manufacturers to repair parts.

Autonomic Logistics Information System Remains Immature

Second, DOD continues to face challenges with the F-35's Autonomic Logistics Information System (ALIS). ALIS is a complex information

technology system supporting operations, mission planning, supply-chain management, maintenance, and other processes. It is intended to provide the necessary logistics tools to F-35 users as they operate and sustain the aircraft. For supply chain management, for example, ALIS is supposed to automate a range of supply functions—including updating the status of parts, generating supply work orders, and communicating critical data about parts.

However, we reported in April 2019 that these capabilities were immature, resulting in numerous challenges and the need for maintainers and supply personnel at military installations to perform time-consuming, manual workarounds in order to manage and track parts.¹⁰ We reported that one Air Force unit estimated that it spent the equivalent of more than 45,000 hours per year performing additional tasks and manual workarounds because ALIS was not functioning as needed. In our prior work we identified several challenges associated with ALIS, including the following examples (see table 1).

Table 1: Selected Challenges Associated with the F-35 Autonomic Logistics Information System (ALIS)

Challenge	Description
Deployability of ALIS	Users reported concerns about ALIS's ability to deploy in operational environments because of the large server size and connectivity requirements.
Data accuracy and accessibility issues	Users reported concerns about data that reside within ALIS, including errors related to missing or inaccurate information about parts. DOD officials said that errors can require extensive research and troubleshooting to resolve.
Inefficient issue resolution process	Users reported that the process to resolve F-35-related issues within ALIS does not provide transparency for all action requests submitted across F-35 sites, thereby preventing users from potentially identifying timely solutions, and leaving the responsibility for resolving issues primarily with the contractor.

Source: GAO. | GAO-20-234T

We have made six recommendations since 2014 to help DOD address ALIS-related challenges. DOD generally concurred with these recommendations. It addressed two by developing a plan that prioritizes ALIS risks and creating a training plan for ALIS. However, DOD has not taken action on four of our recommendations. These are:

- **Establish a performance-measurement process:** In September 2014, we reported that ALIS had experienced recurring problems, including user issues and schedule delays, and was a risk that could

¹⁰[GAO-19-321](#)

adversely affect DOD's sustainment strategy. But we found that DOD did not have a process to determine and address the most significant performance issues with ALIS based on user requirements, which could limit its ability to effectively and efficiently address performance issues and identify root causes of those issues. We recommended that DOD establish a performance-measurement process for ALIS that includes, but is not limited to, performance metrics and targets that (1) are based on intended behavior of the system in actual operations and (2) tie system performance to user requirements.

- **Incorporate cost-estimating best practices:** In April 2016, we reported that DOD's \$16.7 billion life cycle cost estimate for ALIS was not fully credible since DOD had not performed key analyses as part of the cost-estimating process. We recommended that DOD conduct uncertainty and sensitivity analyses consistent with cost-estimating best practices.
- **Ensure that future cost estimates use historical data:** In April 2016, we also reported that DOD's ALIS cost estimate was not fully accurate because DOD did not use historical cost data, including actual cost data from ALIS and data from other comparable programs. We recommended that DOD ensure that future estimates of ALIS costs use historical data as available and reflect significant program changes consistent with cost-estimating best practices.
- **Test the operation of the F-35 when disconnected from ALIS:** In March 2018, we issued a classified report on DOD's initial transfer of F-35s to a Marine Corps base in Japan that, among other things, described the warfighting capabilities the F-35 brought to the Pacific and assessed any operational challenges the Marine Corps faced.¹¹ In April 2018, we publicly reported on the recommendations from this classified report, including our recommendation that the F-35 program test operating the F-35 disconnected from ALIS for extended periods of time in a variety of scenarios, to assess the risks related to operating and sustaining the aircraft, and determine how to mitigate any identified risks.

We are currently conducting a review of ALIS, assessing how DOD is managing current and future issues related to the system. We plan to complete this review in early 2020.

¹¹GAO-18-79C

DOD Lacks Critical Information to Effectively Plan for Long-term F-35 Sustainment

Third, at the core, DOD's current sustainment challenges have largely resulted from insufficient planning. We have found that DOD lacks information about the technical characteristics and costs of the F-35, which will impair its ability to plan for the long-term sustainment of the F-35 fleet.

The current F-35 sustainment strategy states that the primary contractor will provide logistics support for the aircraft.¹² In October 2017, we reported that while DOD planned to enter into 5-year, fixed-price, performance-based contracts with the prime contractor in the next few years, DOD did not have full information on F-35 technical characteristics or costs to enable it to effectively negotiate those contracts. Specifically, certain technical aspects of the aircraft remained immature or uncertain, including reliability measures that are lagging behind operational requirements.¹³ As previously discussed, in April 2019 we reported that the F-35 program was still not on track to meet its targets for four out of eight reliability and maintainability metrics, and that the program had not taken adequate steps to ensure that those targets would be met. DOD officials told us that there would be inherent risk in signing a long-term, performance-based contract before reliability and maintainability data were more fully known, as those data would influence how much aircraft performance should cost.

In addition, DOD did not have full visibility into the actual costs of some key sustainment requirements that are considered cost-drivers within the program, such as the actual costs of parts and repairs. Thus, DOD had relied on projected parts reliability and pricing to formulate cost estimates. Actual costs of sustainment requirements can change significantly from initial projections. For instance, we reported that, between the program's 2014 and its 2015 estimates, the costs of initial spare parts over the life cycle increased by \$447 million. The lack of cost information continues to

¹²For the purposes of this testimony, the term "prime contractor" refers to Lockheed Martin, as it is the prime contractor for the aircraft and provides overall system integration. Pratt & Whitney is the contractor for the engine of the F-35.

¹³[GAO-18-75](#)

be a challenge for DOD, as we reported in April 2019.¹⁴ DOD officials have stated that they need to know actual costs in order to improve both their confidence in the estimates and their understanding of how cost is related to performance.

Below is pictured an F-35A aircraft being refueled.

Figure 3: Refueling of an F-35A



Source: U.S. Air Force photo by R. Nial Bradshaw. | GAO-20-234T

Further, DOD lacks the technical data from the prime contractor needed to fully understand the technical characteristics of the F-35 aircraft and enable potential competition of future sustainment contracts. Technical data include the blueprints, drawings, photographs, plans, instructions, and other documentation required to adequately produce, operate, and sustain weapon systems. Technical data are critical for weapon systems such as F-35 aircraft, as they provide DOD with the information necessary to support the fleet. In April 2019, we found that challenges related to readiness and costs were driving DOD to begin to develop an option for DOD-led supply chain management as a potential alternative to

¹⁴[GAO-19-321](#)

the performance-based contracts through which the prime contractor would provide logistics support.¹⁵ The DOD-led option would require the department to obtain significant amounts of technical data on F-35 parts from the manufacturers of those parts; however, at that time DOD was facing challenges in obtaining the needed data.

DOD has not fully implemented 10 of our recommendations related to these issues:

- **Develop a long-term Intellectual Property strategy:** In September 2014, we reported that DOD had not identified all of the technical data it needs from the contractor, and at what cost, to enable competition of future sustainment contracts, which put the program at risk of not having the flexibility to make changes to its sustainment strategy. We recommended that DOD develop a long-term Intellectual Property strategy to include, but not be limited to, the identification of current levels of technical data rights ownership by the federal government and all critical technical data needs and their associated costs.
- **Assess whether the program reliability and maintainability targets are still feasible:** In April 2019, we reported that the F-35 program continued to fall short of meeting performance targets for half of its reliability and maintainability metrics. Program officials said that those targets need to be reevaluated to determine more realistic performance targets, but they had not taken action to do so. We recommended that DOD assess whether the program's reliability and maintainability targets are still feasible, and revise accordingly.
- **Identify specific and measurable reliability and maintainability objectives:** In April 2019, we reported that the F-35 program's plan for improving reliability and maintainability did not address the four under-performing metrics. Specifically, the guidance the program has used to implement this plan does not define specific, measurable objectives for what the desired goals for F-35 reliability and maintainability performance should be. As long as these metrics continue to fall short, the military services may have to settle for aircraft that are less reliable and more costly to maintain than originally planned. We recommended that DOD identify specific and measurable reliability and maintainability objectives in its guidance.
- **Link reliability and maintainability improvement projects to the associated objectives:** In April 2019, we reported that the F-35

¹⁵[GAO-19-321](#)

program had not aligned its planned reliability and maintainability improvement projects with reliability and maintainability goals, which could put the program at risk of not meeting those goals. We recommended that DOD identify and document in guidance which reliability and maintainability improvement projects will achieve the identified objectives.

- **Prioritize funding for reliability and maintainability improvement:** In April 2019, we reported that the F-35 program office had estimated potential life-cycle cost savings of more than \$9.2 billion from implementing the reliability and maintainability improvement projects in its plan, but had not prioritized or dedicated funding in its budget necessary to carry out the projects. As a result, projects had been prematurely suspended or delayed. We recommended that the F-35 program office prioritize funding for the reliability and maintainability improvement plan.
- **Re-examine the metrics DOD will use to hold the contractor accountable:** In October 2017, we reported that DOD might not be using the appropriate performance metrics under trial performance-based agreements to achieve desired outcomes or hold the contractor accountable for performance. We recommended that DOD re-examine the metrics that it will use to hold the contractor accountable under the fixed-price, performance-based contracts, to ensure that such metrics are objectively measurable, are fully reflective of processes over which the contractor has control, and drive desired behaviors by all stakeholders.
- **Delay entering into multi-year, fixed-price, performance-based contracts:** In October 2017, we reported that DOD was moving quickly toward negotiating longer-term performance-based contracts without a sufficient understanding of the actual costs and technical characteristics of the aircraft, which put DOD at risk of overpaying for sustainment support that is not sufficient to meet warfighter requirements. We recommended that, before DOD enters into multi-year, fixed-price, performance-based contracts, it ensure that it has sufficient knowledge of the actual costs of sustainment and technical characteristics of the aircraft at system maturity.
- **Obtain comprehensive cost information for F-35 spare parts:** In April 2019, we reported that DOD did not have comprehensive cost information for individual F-35 spare parts, and that it faced challenges in obtaining this information from the prime contractor. This lack of cost information impedes DOD's ability to develop a complete understanding of the costs for the F-35 system and to effectively negotiate with the prime contractor for sustainment support.

We recommended that DOD develop a methodical approach to consistently obtain comprehensive cost information from the prime contractor for F-35 spare parts within the supply chain.

- **Formalize a methodology for recording military service funds spent on F-35 parts:** In April 2019, we reported that the military services could not track the funds that they had spent for the purchase of F-35 spare parts to the actual parts on their financial statements, thereby hindering DOD's financial improvement and audit readiness efforts. We recommended that DOD complete and formalize a methodology for the U.S. services to use in recording on their financial statements the funds spent on F-35 parts within the global spares pool.
- **Clearly define the F-35 supply chain management strategy:** In April 2019, we reported that DOD was caught between two distinct sustainment concepts—the program's official contractor-provided logistics support construct and DOD's effort to develop options for DOD-led supply chain management. Until DOD clearly defines its strategy for managing the F-35 supply chain in the future, the F-35 program will lack the certainty and unity of effort necessary to meaningfully improve supply chain performance and reduce costs. We recommended that DOD clearly define the strategy by which it will manage the F-35 supply chain in the future and update key strategy documents accordingly, to include any additional actions and investments necessary to support that strategy.

DOD concurred with all of these recommendations. Seven of the preceding recommendations were made earlier this year, and we recognize that it will take time for DOD to implement them. However, DOD's attention to each of these recommendations is important to improving its long-term sustainment planning.

In summary, DOD's costs to purchase the F-35 are expected to exceed \$406 billion, and the department expects to spend more than \$1 trillion to sustain its F-35 fleet. Thus, DOD must continue to grapple with affordability as it takes actions to increase the readiness of the F-35 fleet and improve its sustainment efforts to deliver an aircraft that the military services and partner nations can successfully operate and maintain over the long term within their budgetary realities. DOD's continued attention to our recommendations will be important as it balances these goals. We will continue to monitor DOD's efforts to implement our recommendations.

Chairmen Garamendi and Norcross, Ranking Members Lamborn and Hartzler, and Members of the Subcommittees, this completes my prepared statement. I would be pleased to respond to any questions that you may have at this time.

GAO Contact and Staff Acknowledgments

If you or your staff have questions about this testimony, please contact Diana Maurer, Director, Defense Capabilities and Management, at (202) 512-9627 or maurerd@gao.gov.

Contact points for our offices of Congressional Relations and Public Affairs may be found on the last page of this statement. GAO staff who made key contributions to this testimony are Alissa Czyz and Kasea Hamar (Assistant Directors); Jon Ludwigson, Vincent Buquicchio, Tracy Burney, Desiree Cunningham, Jeff Hubbard, Justin Jaynes, Amie Lesser, Sean Manzano, Jillena Roberts, Michael Silver, Maria Staunton, Tristan T. To, Cheryl Weissman, and Elisa Yoshiara.

Related GAO Products

F-35 Joint Strike Fighter: Action Needed to Improve Reliability and Prepare for Modernization Efforts. [GAO-19-341](#). Washington, D.C.: April 29, 2019.

F-35 Aircraft Sustainment: DOD Needs to Address Substantial Supply Chain Challenges. [GAO-19-321](#). Washington, D.C.: April 25, 2019.

F-35 Joint Strike Fighter: Development Is Nearly Complete, but Deficiencies Found in Testing Need to Be Resolved. [GAO-18-321](#). Washington, D.C.: June 5, 2018.

Warfighter Support: DOD Needs to Share F-35 Operational Lessons Across the Military Services. [GAO-18-464R](#). Washington, D.C.: April 25, 2018.

Military Aircraft: F-35 Brings Increased Capabilities, but the Marine Corps Needs to Assess Challenges Associated with Operating in the Pacific. [GAO-18-79C](#). Washington, D.C.: March 28, 2018.

F-35 Aircraft Sustainment: DOD Needs to Address Challenges Affecting Readiness and Cost Transparency. [GAO-18-75](#). Washington, D.C.: October 26, 2017.

F-35 Joint Strike Fighter: DOD's Proposed Follow-on Modernization Acquisition Strategy Reflects an Incremental Approach Although Plans Are Not Yet Finalized. [GAO-17-690R](#). Washington, D.C.: August 8, 2017.

F-35 Joint Strike Fighter: DOD Needs to Complete Developmental Testing Before Making Significant New Investments. [GAO-17-351](#). Washington, D.C.: April 24, 2017.

F-35 Joint Strike Fighter: Continued Oversight Needed as Program Plans to Begin Development of New Capabilities. [GAO-16-390](#). Washington, D.C.: April 14, 2016.

F-35 Sustainment: DOD Needs a Plan to Address Risks Related to Its Central Logistics System. [GAO-16-439](#). Washington, D.C.: April 14, 2016.

F-35 Joint Strike Fighter: Preliminary Observations on Program Progress. [GAO-16-489T](#). Washington, D.C.: March 23, 2016.

F-35 Joint Strike Fighter: Assessment Needed to Address Affordability Challenges. [GAO-15-364](#). Washington, D.C.: April 14, 2015.

F-35 Sustainment: Need for Affordable Strategy, Greater Attention to Risks, and Improved Cost Estimates. [GAO-14-778](#). Washington, D.C.: September 23, 2014.

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